

## ASPECTS OF THE BREEDING BIOLOGY OF A SUBTROPICAL ORIOLE, *ICTERUS GULARIS*

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In this paper I describe several aspects of the breeding biology of Lichtenstein's Oriole (*Icterus gularis*). Similar to other subtropical and tropical orioles *I. gularis* is sexually monomorphic, is resident throughout the year and is found in wooded habitats. Although breeding populations of *I. gularis* are established in the U.S., little information is available for this species in any portion of its range. There are brief discussions of its life history (Bent 1958, Oberholser 1974) and a description of nest-building (Sutton and Pettingill 1943).

### METHODS

*I. gularis* occurs from the Rio Grande Valley southward through eastern Mexico to Guatemala. This study was conducted at the northern limit of the range of the species, on the Santa Ana National Wildlife Refuge near Alamo, Hidalgo Co., Texas. The area is warm and relatively dry, with a mean annual rainfall of 45 cm (Fleetwood 1973). The refuge consists of 800 ha covered, in most sections, by primarily evergreen, dry, subtropical forest. The land surrounding the refuge has been cleared for agriculture, leaving Santa Ana as an island of natural habitat. The commonest trees are Texas ebony (*Pithecellobium flexicaule*), tepeguaje (*Leucaena pulverulenta*), elm (*Ulmus* spp.) and ash (*Fraxinus* spp.). Below the canopy is a dense understory of shrubs and thorny vines.

Almost all observations were made from 16 May-6 June 1974. Two brief visits during March 1977 and March 1978 provided additional information. I found 19 nests (two were outside the refuge boundaries) during the 1974 study and at eight of these I collected data on various aspects of parental behavior (Pleasant 1977). Most nests were found while clutches were being incubated. Once located, a nest was checked daily and extensive observation began when the eggs hatched. I then observed the activity at each nest as often as possible for the remainder of the study. Most nests were observed on three or more different days (Table 1). I obtained information on type of food brought to young, frequency of feeding of nestlings and adult behavior in the vicinity of the nest. A total of 1744 min of these observations were made at the 8 suitable nests (Table 1). A single observation session lasted 30-60 min; generally these sessions occurred between 07:30 and 12:00 or between 15:00 and 20:00 when the adults were most active. Because of the inaccessible nature of the nests, no data on contents could be obtained. Locations of all nests were plotted on a map of the refuge.

### RESULTS AND DISCUSSION

*Characteristics of breeding adults.*—All adults seen at nests were in full adult plumage (orange and black). Temperate oriole populations, on the other hand, often have significant proportions of breeding first-year males (pers. obs., Rising 1970, Sealy 1980). These first-year males have not attained adult male appearance and resemble females in coloration. Adult

TABLE 1  
OBSERVATION PERIODS FOR *ICTERUS GULARIS* DURING NESTLING STAGE, 1974

Pair/nest	Dates of observation	No. of observation periods	Total time observed (min)
1	18–29 May	10	400
2	21 May–4 June	10	585
3	20 May–4 June	4	180
4	31 May–5 June	3	121
5	29 May–6 June	3	134
6	31 May–3 June	2	124
7	1 June–4 June	3	110
8	24–28 May <sup>a</sup>	4	90

<sup>a</sup> Brood apparently destroyed between 24 and 25 May.

mortality in tropical passerines is low (Cody 1971); breeding territories and pair bonds may be permanent (Orians 1969). Young birds will find it difficult to enter the breeding population under such circumstances. In the tropical Rufous-collared Sparrow (*Zonotrichia capensis*), young birds remain on the permanent territories of adults waiting for vacancies to occur in the breeding population (Smith 1978). Young *I. gularis* may employ the same strategy. Activities near the nest of a widowed female *I. gularis* (nest 7) may aid in understanding the process of entry into the breeding population by young birds. (The presumed mate of this bird was found dead on the road quite close to the nest.) She continued to feed the nestlings on her own for the remainder of my stay on the refuge (6 days). A male in immature plumage (yellow and black) was repeatedly seen in the vicinity of the nest. He never brought food to the nestlings and spent a good part of his time singing. I observed no interactions between him and the female.

*Nests.*—*I. gularis* builds a pendulous nest approximately 60 cm in length. The nest is situated on a branch tip 10 m or more above the ground, and is conspicuous (also see Sutton and Pettingill 1943). The trees selected as nest-sites are typically emergent above the canopy, so the nest is visible for some distance. Leaves of the preferred nest trees (legumes like *Pithecellobium*) are woven into the nest and the structure swings freely. Nine of 10 nests checked for placement were within the NW quadrant of the nest tree. The length of the nest makes it necessary for adults to land first on the upper part of the exterior and then maneuver to crawl head downwards into the bag itself. This delay facilitated my observation of individuals and of food items they carried for nestlings.

Nest-building takes up to 26 days in *I. gularis* (Oberholser 1974). This is in marked contrast to the 5–6 days temperate species (Northern Oriole [*I. galbula*], Hooded Oriole [*I. cucullatus*]) spend building their smaller nests (pers. obs.). This difference in nest-size and building period may be attributable to the permanent resident status of *I. gularis*, which allows the species more time to build a secure structure. Ricklefs (1969) suggested that tropical birds' more complex forms of nest construction are due to predation pressure. The length of *I. gularis* nests makes quick entry and exit by brood parasites or predators quite difficult. The structure of these nests is presumably the result of selection pressure to reduce egg and nestling mortality (see below, Behavior at nest).

*Spacing system.*—Mean nearest-neighbor distance for the 17 nests located within the refuge was 250 m (range 63–443 m, distances measured on map). Two other nests were located in small stands of trees outside the refuge boundary. During all the time I spent watching *I. gularis* from nest-building to fledging, I saw only one instance of aggression between pairs. These birds are solitary nesters with exclusive access to the food resources in the territories which surround their nests. Year-round residence may greatly lower the frequency of overt territorial defense. All-purpose territoriality (Type A) is predicted for a species nesting in a large patch of relatively uniform habitat, such as a forest (Brown 1964, Horn 1968). This contrasts with the more colonial spacing system characteristic of Northern Orioles breeding in small patches of riparian woodland surrounded by habitat unsuitable for nesting (Pleasants 1979).

*Behavior at nest.*—Compared to *I. galbula*, *I. gularis* is a quiet species. Males sing and whistle softly, usually near the nest, while females rarely sing. The chattering sound so common in Northern Orioles is lacking. Instead, both adults utter a soft “nasal” call as a contact note and when arriving at the nest with food.

Nestlings and fledglings of *I. gularis* also tend to be quiet. None of the fledglings of two broods made any sounds that I heard. In contrast, I could easily locate fledgling *I. galbula* by their constant begging calls. This interspecific difference in behavior of young may reflect differences in the causes of fledgling mortality; predation is potentially a more significant factor for *I. gularis*.

I found that *I. gularis* adults produced a characteristic call as their young approached fledging. This two-note call, similar to the beginning of full song, was not heard earlier in the nesting cycle. Parents continued to use this call when approaching young even after the young had fledged.

*Feeding.*—Like most icterids, orioles are generalists with regard to diet. Although primarily insectivorous, they will also take nectar and fruit. I observed no *I. gularis* young being fed fruit and saw an adult eating fruit

TABLE 2  
FOOD ITEMS BROUGHT TO NESTLINGS

Food item	No. items	% total
Grasshoppers (Orthoptera)	42	33
Caterpillars and other larvae	36	29
Walkingsticks (Phasmidae)	26	21
Other insects	4	3
Unidentified	18	14

only once. Oberholser (1974) states that adults eat hackberries (*Celtis* sp.) and figs (*Ficus* sp.). Table 2 lists food items brought to nestlings by *I. gularis* parents.

Data on the rate at which nestlings were fed were gathered at all nests which had young during the study. Fig. 1 shows the negative relationship between age of nestlings and the interval between successive feedings by adults (Spearman rank correlation,  $r = -0.719$ ,  $P < 0.01$ ). During the first two days post-hatching, feeding intervals are substantially longer than on succeeding days and longer than intervals for *I. galbula* of similar age (Pleasants, unpubl.). From the third day on, feeding intervals for *I. gularis*

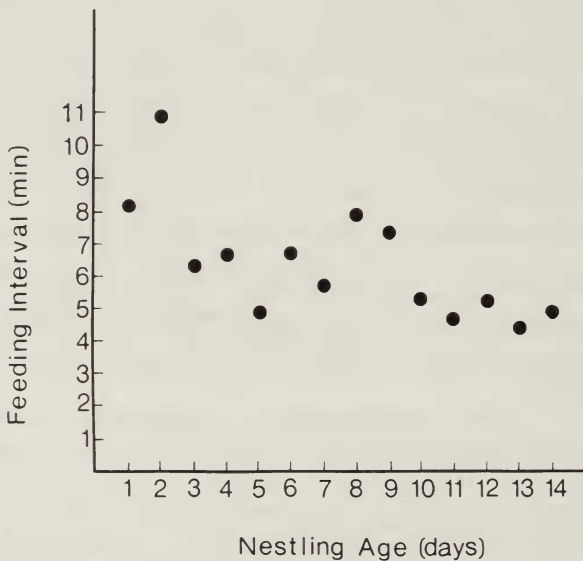


FIG. 1. Feeding interval as a function of nestling age. Each point is based on data for 1-4 pairs.

fall within the range of intervals I found for seven populations of *I. galbula*. Interestingly, feeding intervals for *I. galbula* do not decrease as nestlings get older. (These differences between species will be discussed further in a separate paper.) The widowed female, whose nestlings were of unknown age, brought food at intervals from 4.5–5 min on three successive days. Surprisingly, these intervals correspond to those for nestlings with two parents.

Skutch (1943) suggested that tropical birds feed their young less often than their temperate relatives in order to reduce chances of detection by predators. For *I. gularis* this may be true when nestlings first hatch, but for the bulk of the nestling period food availability and demands of growing young preclude such a strategy.

*Interactions with other species.*—The Bronzed Cowbird (*Molothrus aeneus*) is abundant on the refuge, its numbers having increased in recent years. Parasitism by this cowbird is believed responsible for the disappearance of Hooded Orioles from the refuge (Oberholser 1974). I often saw groups of 3–5 cowbirds near *I. gularis* nests, particularly those in which eggs had not yet hatched. During a 30-min period, one nest was approached by three cowbirds shortly after the orioles had left the tree. The cowbirds remained for 15 min despite an attempt by the returning male oriole to drive them away. During a later 60-min period of observation at the same nest 1–3 cowbirds approached five separate times, often landing directly on the nest. A female cowbird entered the nest and remained inside for 4.5 min. This oriole pair was probably at the egg-laying stage when this occurred; nest-building was complete and incubation began a few days later.

Orioles often nest near kingbirds (*Tyrannus* spp.) or other large tyrannids, according to anecdotal accounts (Bent 1958). Many flycatcher species are aggressive, vociferous birds that readily attack predators larger than themselves. On the Santa Ana Refuge the Kiskadee Flycatcher (*Pitangus sulphuratus*) is the most conspicuous large flycatcher. Four of 10 *I. gularis* nests were placed within 3–4 m of kiskadee nests and one of the four was also close to the nest of a pair of Tropical Kingbirds (*T. melancholicus*). This suggests the existence of a nesting association from which the orioles gain protection as a result of the presence of large tyrannids.

Several observations support the protection hypothesis. One pair of orioles was reluctant to approach the nest with food when I first began my observations. Instead, a bird would perch in a nearby tree with food items visible in its bill. After the return of a kiskadee to its own nest about 3 m away, the oriole would fly to its nest and feed the young. When feeding young, each kiskadee adult usually waited near the nest for its mate to return before leaving on its next foraging trip, so that at least one adult

was in the vicinity of the nest. In contrast, orioles would often leave together on foraging trips. More importantly, kiskadees do chase other birds from oriole nests. Bronzed Cowbirds were chased on four occasions; chachalacas (*Ortalis vetula*) and an unidentified dove were also chased. One kiskadee, nesting 2 m from the widowed female oriole, chased the young male oriole that had taken up residence on her territory. The Tropical Kingbirds nesting near pair #2 chased Great-tailed Grackles (*Quiscalus mexicanus*)—known predators on eggs and nestlings (Bent 1958). If this is an actual association between orioles and large tyrannids, rather than chance close proximity, there should be selection by orioles of nest-sites near Kiskadee Flycatchers. Kiskadees appear to begin nest-building before the orioles do (Pleasants, pers. obs. March 1977).

#### SUMMARY

Lichtenstein's Orioles were studied for three weeks during the breeding season on the Santa Ana National Wildlife Refuge in southern Texas in 1974. I located 19 nests and made extensive observations at eight of them. All breeding birds were in full adult plumage. A first-year male was repeatedly seen in the vicinity of a widowed female with young and the possible significance of this is discussed. Nests are large, pendulous structures, situated in emergent leguminous trees and generally located in the NW portion of the tree. Food items brought to nestlings are listed. The mean interval between successive feedings decreases as nestlings get older. There may be a nesting association between these orioles and large tyrannid flycatchers which would benefit the orioles by protection from brood parasites and predators.

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#### LITERATURE CITED

- BENT, A. C. 1958. Life histories of North American blackbirds, orioles, tanagers and allies. U.S. Natl. Mus. Bull. 211.
- BROWN, J. L. 1964. The evolution of diversity in avian territorial systems. *Wilson Bull.* 76:160-169.
- CODY, M. L. 1971. Ecological aspects of reproduction. Pp. 461-512 in *Avian biology*, Vol. 1 (D. Farner and J. King, eds.). Academic Press, New York, New York.
- FLEETWOOD, R. J. 1973. Plants of Santa Ana National Wildlife Refuge. U.S.D.I., Fish and Wildl. Serv.
- HORN, H. S. 1968. The adaptive significance of colonial nesting in the Brewer's Blackbird. *Ecology* 49:682-694.
- OBERHOLSER, H. C. 1974. The bird life of Texas. Univ. Texas Press, Austin, Texas.

- ORIAN, G. H. 1969. The number of bird species in some tropical forests. *Ecology* 50:783-801.
- PLEASANTS, B. Y. 1977. Ecological factors affecting the breeding dispersion patterns of some North American orioles (*Icterus*). Ph.D. thesis. Univ. California, Los Angeles, California.
- . 1979. Adaptive significance of the variable dispersion pattern of breeding Northern Orioles. *Condor* 81:28-34.
- RICKLEFS, R. E. 1969. The nesting cycle of songbirds in tropical and temperate regions. *Living Bird* 8:165-175.
- RISING, J. D. 1970. Morphological variation and evolution in some North American orioles. *Syst. Zool.* 19:315-351.
- SEALY, S. G. 1980. Breeding biology of Orchard Orioles in a new population in Manitoba. *Can. Field-Nat.* 94:154-158.
- SKUTCH, A. F. 1949. Do tropical birds rear as many young as they can nourish? *Ibis* 91:430-455.
- SMITH, S. M. 1978. The "underworld" in a territorial sparrow: adaptive strategy for floaters. *Am. Nat.* 112:571-582.
- SUTTON, G. M. AND O. S. PETTINGILL, JR. 1943. The Altamira Oriole and its nest. *Condor* 45:125-132.

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